CLAIMS

We claim:

1. A fuel cell electrode comprising:

a support structure comprising bacterial cellulose; and

a catalyst disposed in or on the support structure, the catalyst being selected from transition metals.

2. The fuel cell electrode of claim 1 wherein:

the catalyst is selected from platinum group metals.

3. The fuel cell electrode of claim 1 wherein:

the catalyst is palladium.

4. The fuel cell electrode of claim 1 further comprising:

an electrically conductive current carrier that contacts the support structure.

5. The fuel cell electrode of claim 1 wherein:

the support structure consists essentially of bacterial cellulose.

6. The fuel cell electrode of claim 1 further comprising:

an enzyme disposed in or on the support structure.

7. A method for recovering the catalyst from the fuel cell electrode of claim 1 comprising burning or hydrolyzing the support structure.

8. An electrolyte membrane for a fuel cell, the electrolyte membrane comprising:

a support structure comprising bacterial cellulose; and

a metal salt disposed in or on the support structure.

9. The electrolyte membrane of claim 8 wherein:

the metal salt is selected from alkali metal salts.

10. The electrolyte membrane of claim 8 further comprising:
a sulfonated polymer disposed in or on the support structure.

11. The electrolyte membrane of claim 10 wherein:
the sulfonated polymer is carrageenan.

12. A fuel cell comprising:
an electrolyte membrane comprising a membrane support structure comprising bacterial cellulose;
an anode disposed on one side of the electrolyte membrane; and
a cathode disposed on an opposite side of the electrolyte membrane,
wherein at least one of the anode and the cathode comprises an electrode support structure comprising bacterial cellulose, and a catalyst disposed in or on the electrode support structure.

13. The fuel cell of claim 12 wherein:
the catalyst is selected from platinum group metals.

14. The fuel cell of claim 12 wherein:
the catalyst is palladium.

15. The fuel cell of claim 12 wherein:
a metal salt disposed in or on the membrane support structure.

16. The fuel cell of claim 12 wherein:
a sulfonated polymer is disposed in or on the support structure.

17. A method for impregnating bacterial cellulose with a metal, the method comprising:
preparing a matrix comprising bacterial cellulose; and
placing the matrix in a solution of a metal salt for a sufficient time period such that the metal salt is reduced to metallic form and the metal precipitates in or on the matrix.

18. The method of claim 17 wherein:

the metal salt is selected from coordination compounds including a platinum metal group complex ion, and mixtures thereof.

19. A method for forming a fuel cell, the method comprising:

preparing an electrode support structure comprising hydrated bacterial cellulose;

placing the electrode support structure in a solution of a metal salt for a sufficient time period such that the metal salt is reduced to metallic form and the metal precipitates in or on the electrode support structure;

dehydrating the electrode support structure to form an electrode material;

dividing the electrode material into an anode and a cathode;

preparing a membrane support structure comprising hydrated bacterial cellulose;

placing the anode on one side of the membrane support structure;

placing the cathode on an opposite side of the membrane support structure; and

dehydrating the membrane support structure thereby affixing the anode and the cathode to the membrane support structure.

20. The method of claim 19 wherein:

the metal salt is selected from coordination compounds including a platinum metal group complex ion, and mixtures thereof.